

### **REMARKS**

Entry of the foregoing amendments, favorable reconsideration, reexamination, and allowance of the present patent application are respectfully requested in view of the following remarks. Claim 6 has been placed in independent form; no other amendments have been made.

#### **Rejection under 35 U.S.C. § 102**

In the Office Action, beginning at page 3, Claims 1-3, 7, and 8 were rejected under 35 U.S.C. § 102, as reciting subject matters that allegedly are anticipated by *Gutmark*. Applicant respectfully requests reconsideration of this rejection.

Applicant first notes that *Gutmark* was invented by the inventors herein, and thus Applicant has an intimate understanding of its disclosure.

This application describes embodiments of methods and systems exemplifying principles of the present invention useful for addressing thermoacoustic oscillations in combustion systems. One aspect of the present invention includes the general idea of separately affecting a plurality of interference frequencies of the thermoacoustic oscillations. In this way, detrimental interactions which, when combating one interference frequency, can cause amplification of the another interference frequency, can be reduced or eliminated. It has been shown that, by means of the procedure according to the invention, at least damping of the main interference frequency can be boosted considerably.

Claim 1 relates to a method for affecting thermoacoustic oscillations in a combustion system including coordinating the acoustic excitations of the gas flow, the modulated injections of the fuel, or both, to simultaneously affect at least two different interference frequencies of the thermoacoustic oscillations.

Claim 7 relates to a device for affecting thermoacoustic oscillations in a combustion system having combination of elements including, *inter alia*, a control system driving an at least one acoustic source, an at least one control valve, or both, to simultaneously affect at least two different interference frequencies of the thermoacoustic oscillations.

The prior art, including *Gutmark*, fails to identically disclose or describe the subject

matters of the pending claims.

In the Amendment filed 14 November 2005, Applicant summarized certain aspects of *Gutmark*; accordingly, Applicant will not further burden the record with duplicative text, and merely incorporates that discussion by reference.

Item 4 of the Office Action, appearing at pages 2-3, alleges that multiple frequency waves are introduced into a gas flow shear layer (col. 2, lines 32–61 of *Gutmark*) and that the acoustic excitation functions to counteract the formation of “multiple interference frequencies” (col. 3, lines 54–59 of *Gutmark*). A closer inspection of these passages reveals, however, that the Office Action replaces “coherent structures” with “multiple interference frequencies”. In the last sentence thereof, the Office Action expressly states that the “coherent structures” are regarded as the “multiple interference frequency waves”.

Applicants have considered this statement, and cannot agree. There exists no direct connection between the two cited passages of the description. The first cited passage (col. 2, lines 32-61) describes the thesis that influencing the shear layer has the advantage that excitations which are introduced are amplified in the shear layer (col. 2, lines 33-34). In the text that follows that passage, *Gutmark* describes some investigations performed in the prior art to verify that thesis, and concludes that it is to the best advantage to carry out the excitations of the gas flow within the shear layer.

The second cited passage (col. 3, lines 54-59) only states that acoustic excitations counteract the formation of coherent structures, if the acoustic excitation is chosen with a suitable phase shift. There is no discussion, suggestion, or even a hint of multiple frequencies.

The term “coherent structure” seems to be misunderstood in the Office Action, and Applicant understands that “coherent structure” is not the same as “multiple frequencies”. *Gutmark* provides, at col. 1, line 63, to col. 2, line 6, some explanations what “coherent structures” could be. As Applicant understands this passage, the term “coherent structure” describes the complex interrelationship between air and fuel which is responsible for the mixing action; as an example, “vortex structures” are named (col. 2, line 1). In particular, in col. 1, lines 66-67, *Gutmark* states that the invention is based on the idea of counteracting “the formation of

coherent structures”, and in the next sentence is stated that “*this* reduction of vortex structures” also results in . . .” Thus, in *Gutmark*’s context, “coherent structures” and “vortex structures” are used synonymously. Additionally, the idea of *Gutmark* as stated in col. 1, line 63, to col. 2, line 6, is not based on counteracting the formation of thermoacoustic vibrations directly, but rather based on counteracting the formations of coherent structures, and therefore counteracting the formation of the thermoacoustic vibrations indirectly. Accordingly, the “coherent structures” are not the same as “multiple frequencies” and cannot be used as a synonym for “multiple frequencies”.

Accordingly, *Gutmark* does not identically disclose the simultaneous affectation of at least two different frequencies.

For at least the foregoing reasons, Applicant respectfully submits that the subject matters of Claims 1-3, 7, and 8 are not anticipated by *Gutmark*, are therefore not unpatentable under 35 U.S.C. § 102, and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 102.

#### **Rejection under 35 U.S.C. § 103(a)**

In the Office Action, beginning at page 4, Claims 4-6 were rejected under 35 U.S.C. § 103(a), as reciting subject matters that allegedly are obvious, and therefore allegedly unpatentable, over *Gutmark* in view of *Paschereit*. Applicant respectfully requests reconsideration of this rejection.

Claim 6 relates to a method for affecting thermoacoustic oscillations in a combustion system including, *inter alia*, affecting one interference frequency by acoustic excitation of the gas flow, and affecting another interference frequency by modulated injection of the fuel.

Assuming, *arguendo*, that one of ordinary skill in the art would somehow find motivation to combine the disclosures of *Gutmark* and *Paschereit* in the manner alleged to be obvious in the Office Action, the resulting hypothetical constructs and methods would still not include each and every element or step recited in the pending claims, at least because neither discloses or suggests simultaneously affecting at least two different interference frequencies. Instead, a combination

of *Gutmark* and *Paschereit* could only lead, at best, to a method/device adapted for affecting thermoacoustic oscillations by means of acoustic excitations and by fuel modulation at the respective interference frequency to be damped. There is no suggestion of simultaneously affecting at least two different interference frequencies.

One of ordinary skill in the art would find no motivation to combine the disclosures of *Gutmark* and *Paschereit* to arrive at the presently claimed invention. Instead, the claimed combinations could only be arrived at through an impermissible hindsight reconstruction of the claimed combinations by reference to the Applicant’s own specification.

Additionally concerning Claim 6, since *Gutmark* only discloses affecting the (single) interference frequency by acoustic excitation, and since *Paschereit* only discloses affecting the (single) interference frequency by fuel modulation, assuming *arguendo* that the ordinarily skilled artisan would somewhere find motivation to combine the two, the result could at most be a system in which a first interference frequency is affected by acoustic excitation and a second interference frequency is affected by fuel modulation. While neither *Gutmark* nor *Paschereit*, nor any other prior art, discloses, describes, or suggests such a combination, this combination would result in a system affecting the single interference frequency (or the same interference frequencies) by acoustic excitation and by fuel modulation, and not affecting one interference frequency by acoustic excitation of the gas flow, and affecting another interference frequency by modulated injection of the fuel, as recited in the combination of Claim 6.

For at least the foregoing reasons, Applicant respectfully submits that the subject matters of Claims 4-6, each taken as a whole, would not have been obvious to one of ordinary skill in the art at the time of Applicant’s invention, are therefore not unpatentable under 35 U.S.C. § 103(a), and therefore respectfully requests withdrawal of the rejection thereof under 35 U.S.C. § 103(a).

### **Obviousness-type Double Patenting**

In the Office Action, beginning at page 6, Claim 7 has been (provisionally) rejected under the judicially-created doctrine of obviousness-type double patenting over Claim 7 of copending application number 10/725,563 (“‘563 application”), as allegedly improperly extending the

patent monopoly were both claims granted. Applicant respectfully requests reconsideration of this rejection.

The Office Action alleges, at page 6, that:

the structure recited in each of these claims is substantially identical. That the control systems function to affect different interference frequencies does not render the device claims distinct. This recited functioning of the control system is merely a recitation of the intended use of the control system and does not serve to structurally distinguish claim 7 of this application from claim 7 of [the '563 application].

Applicant strongly disagrees with Mr. Cocks' interpretation of the claim language, and thus his conclusions about the separate patentability of the two claims.

Mr. Cocks' opinion appears to be that the function of a control system does not limit that control system, and therefore all control systems are structurally identical; this is plainly incorrect. Following Mr. Cocks' statement to a logical conclusion, it would necessarily follow that no control system would ever be patentable, once a prototypical control system was described in the public literature. This would be because, despite the myriad functions of the control systems that are developed in numerous art areas, the fundamental hardware, on which the logic of the control would be implemented, pre-exists. Mr. Cocks' interpretation ignores both the fact that the U.S. Patent and Trademark Office ("PTO") weekly issues many patents for control systems, and also ignores the correct interpretation of the claim terms: the function of a control system DOES structurally limit an apparatus claim. Were Mr. Cocks' legal interpretation correct, every control system claim issued by the PTO would be facially invalid, because their recited functions would be non-limiting, not to mention numerous decisions by the various federal district courts and the Court of Appeals of the Federal Circuit would be subverted.

Instead, however, the different functions recited in Claims 7 of this and the '563 application limit the claims in which they appear, and are not merely recitations of intended uses of an apparatus. Accordingly, the claims have definitively different scopes, and the Office Action has not offered any explanation why the difference in these scopes would be unpatentable.

Furthermore, the device of Claim 7 of the '563 application patentably distinguishes from the device of Claim 7 of this application. The device of claim 7 of this application distinguishes from the device of claim 7 of the '563 application by the embodiment of the control system. In this application, the control system is adapted for driving the acoustic source(s) and the control valve(s) to simultaneously affect the at least two different interference frequencies. In the '563 application, the control system is adapted for driving the acoustic source(s) and the control valve(s) to affect the same interference frequencies. In order to perform these different tasks, the control systems must be different, *e.g.*, at least with respect to any integrated hardware and/or with respect to the implemented software. As an illustrative example, there is visibly no outward difference between a two-wheel driven Mercedes Benz S 300, having a Diesel engine producing 100kW, and a four-wheel driven Mercedes Benz S 600, having an Otto engine producing 300kW; however, the two cars will obviously be very different in operation, as will the apparatus recited in Claim 7 of this and the '564 application.

For at least the foregoing reasons, Applicants respectfully submit that the subject matter of Claim 7 is separately patentable over the subject matter of Claim 7 in the '564 application, and therefore respectfully requests withdrawal of the rejection thereof.

## **Conclusion**

Applicant respectfully submits that the present patent application is in condition for allowance. An early indication of the allowability of this patent application is therefore respectfully solicited.

If Mr. Cocks examiner believes that a telephone conference with the undersigned would expedite passage of this patent application to issue, he is invited to call on the number below.

It is not believed that extensions of time are required, beyond those that may otherwise be provided for in accompanying documents. If, however, additional extensions of time are necessary to prevent abandonment of this application, then such extensions of time are hereby petitioned under 37 C.F.R. § 1.136(a), and the Commissioner is hereby authorized to charge fees necessitated by this paper, and to credit all refunds and overpayments, to our Deposit Account 50-2821.

Respectfully submitted,

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